

Remarks

The following comments are provided in support of the claims presented. Applicants respectfully request reconsideration of the claims and entry of the amendments presented herein.

**1. § 103 Rejections**

A. Claims 1 and 5-9 have been rejected under 35 USC §103(a) as being obvious over Liaw et al (US 6,605,230) in view of Smith et al (US 6,479,395).

Applicants have herein amended Claim 1 to include the limitations of Claims 2 and 3 which are herein cancelled. As amended herein, Claim 1 recites "A method for manufacturing a semiconductor device using a plurality of deposited and patterned layers of polysilicon, an oxide sacrificial material, and a metal layer including aluminum." The Office states on page 4 of paper no. 9 that "Liaw and Smith fail to disclose the present of the aluminum layer in the semiconductor device." Therefore, as amended herein, Claim 1 and Claims 5-9, which recite "a metal layer including aluminum," are unobvious over the combination of Liaw and Smith set forth by the Office.

Applicants further urge that the amendment to Claim 1 also renders this claim unobvious over the combination of Liaw, Smith and Gennissen as set forth in the § 103 rejection of Claim 3, the limitations of which are now included in amended Claim 1. Gennissen requires the use of IPA in combination with HF in order to etch a sacrificial oxide with a very high selectivity to aluminum (see Summary on p. 225). Therefore, if the teachings of Gennissen were to be combined with those of Liaw and Smith, the etchant would necessarily require the use of IPA. However, Applicants do not disclose or claim the use of IPA. Therefore, Applicants' Claims 1 and 5-9 which do not require the use of IPA for etching cannot be obvious in view of the combination of Liaw, Smith and Gennissen which would necessarily require the use of IPA in combination with HF.

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Additionally, Applicants respectfully submit that the Office will not be able to properly combine Gennissen with Liaw and Smith to form a valid *prima facie* case of obviousness for the § 103 rejection of amended Claim 1 since the teachings of Gennissen and Smith are contrary. Gennissen teach against the use of water in an etching solution where aluminum is present since "water addition to the HF will result in rapid attack of the aluminum interconnect due to a higher  $H_3O^+$  concentration." (see last sentence in Conclusions on p. 228). Gennissen also teach against the use of rinsing in water when aluminum is present since: "Rinsing in water is not possible as this would lead to rapid attack of aluminum." (see first paragraph on right-hand side of page 227).

Smith, to the contrary, requires that water be present in the etching solution in an amount of at least 50%: "The ratio of water to the second acid to hydrofluoric acid ranges from 2:1:1 to 50:20:1, depending on the type of glass used for the substrate." (col. 7, lines 16-19). Smith further discloses rinsing in water (see col. 15, lines 29-30), and immersion in water for self assembly (see col. 15, lines 61-65). Therefore, the combination of Gennissen, who teaches against the use of water in the etching solution and for rinsing, and Smith, who require the use of water in the etching solution and for rinsing, would result in a nullity. The contrary teaching of Gennissen and Smith provides evidence for the *prima facie* unobviousness of Claims 1 and 5-9 in view of any combination of Liaw, Smith and Gennissen.

**B.** Claims 3 and 4 have been rejected under 35 USC §103(a) as being obvious over Liaw et al and Smith et al and further in view of Gennissen (Sacrificial Oxide Etching Compatible with Aluminum Metallization, Proceedings of the 1997 International Conference on Solid-State Sensors and Actuators, Transducers '97, pp. 225-228, 1997).

Claim 3 has been cancelled herein.

With regard to Claim 4, Applicants respectfully submit that the Office has not made a valid *prima facie* case of obviousness for the rejection of this claim based on

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the combination of Liaw, Smith and Gennissen since the requirements of Gennissen and Smith are contrary as discussed previously. To summarize, Gennissen teaches against an etching solution containing water since this would result in a "rapid attack of aluminum." Smith, to the contrary, teach a requirement for an etching solution containing at least 50% water. Therefore, one skilled in the art would not utilize the etching solution of Smith for etching a device comprising "a metal layer including aluminum" as required for Claim 4 in view of amended Claim 1 since this would result in a "rapid attack of aluminum" according to Gennissen. The contrary requirements in Gennissen and Smith provide evidence for the *prima facie* unobviousness of Claim 4 in view of the combination set forth by the Office. Therefore, Applicants respectfully submit that the Office has not made a valid *prima facie* case of obviousness for the rejection of Claim 4 so that this claim is allowable.

Furthermore, the etching solution of Gennissen with HF and IPA is fully functional "as is" for etching a sacrificial oxide in the presence of aluminum so that one skilled in the art would be motivated to use as it "as is" when aluminum is present, rather than to use the etching solutions of Liaw and Smith. There is nothing in the art of record that would indicate to one skilled in the art that etching would be successful if an aluminum layer were to be brought into the presence of the etching solutions of Liaw and Smith which include sulfuric acid ( $H_2SO_4$ ). Certainly, based on Gennissen, the presence of water in the etching solution of Smith would be expected to rapidly attack the aluminum layer, contrary to the requirement against such attack stated in Gennissen and also contrary to Applicants' requirement that the aluminum not be substantially damaged (see p. 1, lines 13-14). Therefore, Applicants respectfully submit that, based on the art of record, one skilled in the art would not be motivated to utilize an aluminum layer as disclosed by Gennissen with the etching solutions of Liaw and Smith since this is totally unnecessary, and there would be no reasonable expectation of success. Since there is no reasonable expectation of success for forming Applicants' claimed invention as recited in Claim 4 based on the combination of Liaw, Smith and Gennissen set forth by the Office,

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Applicants respectfully submit that the Office has not made a valid *prima facie* case of obviousness for the rejection of Claim 4 so that this claim is allowable.

**2. Extension of Time**

Applicants hereby petition for a one-month extension of time to respond to the Office Action.

The Office is hereby authorized to charge \$110.00 to Sandia Corporation Deposit Account No. 19-0131 as payment for the one-month extension of time (37 C.F.R. 1.17(a)(1)). If any additional fees are due, the Office is hereby authorized to charge such additional fees to Sandia Corporation Deposit Account No. 19-0131.

A duplicate of this transmittal is enclosed.

Conclusion


Applicants have responded to each and every rejection and objection, and urge that the Application is in condition for allowance. A favorable reconsideration and entry of the amendments presented herein is earnestly solicited as being necessary to place the application in condition for allowance.

Respectfully submitted,

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